CLAIMS

1. A method for the production of a metal oxide, wherein at least one metal oxide precursor is dissolved in a high enthalpy carboxylic acid solvent comprising at least one carboxylic acid with a mean carbon content of >2 carbon atoms in an amount of at least 60 % of the whole solvent to form a solution, and wherein said solution is then formed into droplets and flame oxidized.

2. The method of claim 1, wherein the carboxylic acid content is at least 75 %, preferably at least 90 %, more preferably about 100 %.

3. The method of claim 1 or 2, wherein the at least one carboxylic acid has a mean carbon content per acid group of at least 2.2, preferably at least 3, more preferably about 4 to 10, most preferably about 4 to 8.

4. The method of anyone of the preceding claims, wherein the carboxylic acid is selected from C1 to C18 monocarboxylic acids and mixtures thereof.

5. The method of claim 4, wherein the carboxylic acid is a mixture of formic acid and/or preferably acetic acid and at least one further acid with at least 3 carbon atoms, much preferred a mixture of lauric acid and acetic acid, especially in a ratio of 1:1.

6. The method of anyone of the preceding claims, wherein at least one of the carboxylic acids comprises double bonds and/or substituents, preferably polar substituents, in particular one or more -OH and/or $-NH_2$ and/or $-CONH_2$ groups.

7. The method of anyone of the preceding claims, wherein the solvent has an enthalpy of at least 15 kJ/g, preferably at least 20 kJ/g, more preferably at least 23 kJ/g, e.g. at least about 23.7 kJ/g.

8. The method of anyone of the preceding claims, wherein the metal oxide precursor is a salt or a salt precursor, preferably an organic groups comprising salt, especially a purely organic salt, in particular a salt of at least one carboxylic acid and/or acetylacetonate, optionally as hydrate.

9. The method of anyone of the preceding claims, wherein the flame has a temperature of at least 1000°C, usually at least about 1500°C, preferably at least about 2000°C, usually 1600 to 2600°C.

10. The method of anyone of the preceding claims, wherein the droplets have an average diameter of 0.1 to 100 •m, preferably from 1 to 20 •m.

11. The method of anyone of the preceding claims, wherein the metal is selected from the alkali metal group and/or the alkaline earth metal group and/or the transition metal group, and in particular from cerium (Ce) and/or zirconium (Zr), especially from cerium acetate hydrate and/or zirconium acetylacetonate.

12. A metal oxide that is obtainable by a method of anyone of claims 1 to 11.

13. A metal oxide, in particular according to claim 12, that has a surface after heat treatment at 900°C for 2 hours in air of at least 39 m^2/g, preferably above 50 m^2/g.

14. A metal oxide, in particular according to claim 12 or 13, that is a mixed metal oxide, in particular ceria/zirconia.

15. The metal oxide of claim 14 that is ceria/zirconia, with the zirconium being present in at most 90 atom-%, preferably at most 80 atom-% of total metal atoms.

16. A metal oxide, in particular according to claim 14 or 15, that is phase stable upon heating at 900°C for 2 hours in air.

17. A metal oxide, in particular according to anyone of claims 14 to 16, wherein the two or more metals are homogeneously mixed at atomar level.

18. A metal oxide, in particular according to anyone of claims 12 to 17, that has a dynamic oxygen storage capacity after heat treatment at 700°C for 16 hours in air of at least 1.5 liters O_2 per kg catalyst.

19. A metal oxide, in particular according to anyone of claims 12 to 17, that is zirkonium stabilized with cerium and/or yttrium, preferably cerium or yttrium, in particular in an amount of cerium and/or yttrium of at most 10 atom-% of whole metal content.

20. A catalyst comprising ceria, and/or preferably ceria/zirconia of anyone of claims 12 to 18, said catalyst preferably having a monolithic structure.

21. The catalyst of claim 20 comprising the ceria and/or the ceria/zirconia mixed with monolithic structure giving material such as Al_2O_3.

22. The catalyst of claim 20 or 21 comprising ceria and/or ceria/zirconia in a layer covering a monolithic structure carrier.

23. The catalyst of anyone of claims 20 to 22 comprising additional catalytically active substances such as further metal oxides, e.g. titania, vanadia, chromia, manganese, iron, cobalt, nickel, copper oxides, and/or noble metals, e.g. platinum, palladium, rhodium, ruthenium, rhenium, iridium, all of them alone or in admixture with one or more thereof, or alloys thereof.

24. The catalyst of anyone of claims 20 to 23, that is platinum/ceria/zirconia.

25. Use of a metal oxide of anyone of claims 12 to 18 as at least part of a catalytically active system, in particular for combustion engines.

26. Use of a metal oxide of anyone of claims 12 to 18 for mechanochemical polishing.

27. Use of a metal oxide of anyone of claims 12 to 18 for at least one of the following purposes: as heterogenous catalysts, as structural ceramics, as battery storage materials, for chemical sensors, for elements in energy production, for solar energy production elements, for electron storage in recyclable battery units, as dielectrics, as ferroelectric, as gas permeable membranes, as pigments, polymer additives, stabilizers, magnetic fluids, polishing powders, additives in metal alloys, in armor fabrication, in microelectronics, as electrode raw material, as phosphors for radiation sensitive elements and in displays, cosmetics, pharmaceutical packaging, additive in food and pharmaceutical applications, fuel cells, and/or superconductors.